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Mike: From the Center for Occupational Research and Development, welcome to Preparing Technicians for the Future of Work. I'm your host Mike Lesiecki. In each podcast we'll reach out to people who are actually on the front line of the future of work and hear what they have to say. That means interviews with industry, interviews with working technicians, forward thinkers in the field. We'll do some background research, and we'll curate that research to make sure you have the most up to date and relevant information. And in every episode, we'll suggest action that you can take. We want to inspire you to take that action.

This podcast is brought to you by the Center for Occupational Research and Development, known as CORD, with financial support by a grant from the National Science Foundation's Advanced Technological Education program. Opinions expressed in the podcast do not necessarily represent those of the National Science Foundation. You can find out more about our project and our approach at "PreparingTechnicians.org."

Our guest today is Rich Little. He's a welding engineer at United Launch Alliance. Welcome Rich, would you tell us a bit about your company, what you do there, and maybe a little bit about the career path that brought you there?

Rich: Sure. Good to be here. Mike. Thank you for having me. So, I work for ULA (United Launch Alliance). We're a space vehicle manufacturing company. United Launch Alliance is the world's most experienced space launch company. We manufacture the Atlas Delta and Vulcan Centaur launch vehicles. A little bit about our history: We've flown more than 140 consecutive launches with 100% mission-success rate.

My role in the company: I'm a welding engineer. I work at our one and a half million square foot production facility in Decatur, Alabama. This is where we perform our machining, welding, final assembly operations on our space

vehicles. My specific role: I'm a welding engineer on the Vulcan Centaur program, specifically working the Centaur upper stage production operations.

Really, I found myself in this role through college internships. Pursued welding in college. Welding Engineering through Ferris State University. An internship brought me to United Launch Alliance, and I spent a summer with the company, and was offered a full-time position to come back and support following graduation.

Mike: Rich, I'm glad to hear you say that about internships. We often encourage our students to take advantage of that opportunity or any way to get some work experience while they're in school. I guess that did work for you didn't it?

Rich: It did. It was great insight to a manufacturing field that was otherwise unfamiliar to me. And you never really get to know until you go out there and try!

Mike: Sure. For our people working in technician programs, internships are also available largely for them at a two-year community colleges, too. So, thanks for that comment, Rich.

Let's talk about welding a little bit. Right? Let me start with your perspective on the trends that you see on emerging welding technologies. What's driving them today? What's coming out there? What do you see?

Rich: Great question. Really, some of the key words that come to mind: cost, quality, and accountability. We're striving to make products at lower costs with greater quality standards. And we want traceability.

So, in welding costs, there's a large umbrella of things that can shelter under that. We can think of automation, a more-skilled workforce, and larger-volume manufacturing. Just some of our new welding technologies that have come out——and we can talk that.

And then, quality. We're holding products to a higher standard. And we're starting to build products out of materials that we haven't before. And it's kind of changing that workplace and how we assemble parts.

And then I would say, accountability, as well as data monitoring and some of the other logging features that we have today.

Mike: Rich, are the technicians responsible for the quality? Or do you have a separate Quality Department? Or how does it work?

Rich: I think it's really both. Right? And quality is all of our responsibility in manufacturing. And that attention to detail of the technician and the attention to detail of the Quality Department both should be concerned about quality.

Mike: What about the technology side? You know, there's all these exotic materials or processes. What do you see that's pretty unique and pretty current? What's out there now?

Rich: I would say that one of the things in industry, across various disciplines (of course, I'm speaking a little bit on aerospace, but we also have automotive and other manufacturing umbrellas that fall under) but definitely I would say lighter materials. Aluminum is making more of a presence in the welding world. And thinner materials to support lighter, more capable products.

Mike: I hate to admit this, Rich, but I'm an amateur welder. And boy, welding those thin, light materials is tough! When you were in school did you ever have to weld something that was light and thin? Or maybe you didn't get a chance to do this 'til you reached your internship or your workforce.

Rich: No, I was fortunate to get my first experiences in school. And I remember that being very challenging. Lightweight aluminum or thin aluminum or thin steel substrate, both being hard to weld. And that being something that I needed to spend a lot of time on to understand exactly how to perform that.

Mike: When you were in school, or from your knowledge of educational programs (remember, our focus is sort of at the two-year level), was there enough there about Material Science? Or did you wish you had learned more about the properties of those materials that you were trying to weld? I'm just curious.

Rich: So, that is certainly something that I wish I could have learned more on. And the knowledge that I WAS able to gain on it really helped me in performing welds. Understanding the effect of your work on the material and how that material was going to perform post-weld. It kind of completed the question. Right? I'm making this weld and now it's going to perform. And it kind of answered a lot of

those questions. And it really changed the way you start to think about performing that weld.

Mike: Yeah. That's good advice, then, for programs. So, I think every welding program I know has probably at least one course on Welding Materials. But, from listening to you, I'm guessing that's even more important today, especially with, what I think of as, these more exotic materials.

Rich: I agree. We have to treat them a little different.

Mike: Alright. I've got a question for you, and it has to do with laser welding. Does aerospace industry overall do a lot of laser welding? Do people in school get enough experience with laser welding technology?

Rich: So, I think one thing with the universities is laser welding equipment, being kind of new, very expensive systems, very complex. And I was fortunate to have some exposure to lasers in school. And that kind of laid a groundwork for a familiarity with laser cutting and welding systems. I certainly believe that as the manufacturing market goes towards——as you're mentioning——these exotic and lighter materials, that there's a wide range of benefits with laser that kind of complements those materials. So, I do believe that having that in school is very important. And I understand the challenge of making that equipment available just because of its cost and complexity.

Mike: You know, Rich, you mentioned automation. So, let's take your company, but maybe more broadly, the aerospace industry. Is automated welding the norm? Or is it coming on? Is it the "norm" in your company, in your industry, that welds are done by automated systems?

Rich: Not necessarily. I think that's an approach that's being more widely investigated by aerospace. I think there's benefits to automation in manufacturing cycle time and repeatability of our manufacturing processes. But as we started this conversation with costs and quality, accountability——under the cost, there's a wide range of benefits to having automated systems on a manufacturing line.

Mike: Hmmm. You mentioned something, Rich, that I hadn't really thought of until you just said it. In your workforce, or in the aerospace industry in general, are the people that work there, are your technicians aware of these things like "cycle time" or "overall equipment efficiency?" Do they

understand "factory metrics" that help drive the company? Is that important to you?

Rich: Absolutely! As far as the technicians, I certainly do, because they live in that world. I think that they see that every day. And maybe they don't necessarily realize it when it's happening. Thinking about that question, let's say you were coming brand new, and trying to go into aerospace or really any manufacturing discipline that there is, whether that be automotive, or shipbuilding. I think having a knowledge of cycle times and manufacturing efficiency is important. It's certainly a business goal. Right?

Mike: Right. All right. Here's something I found online. It's a quote from you, Rich, that says, "Manufacturing challenges are doors for innovation." I like that quote! Can you give me an example of how a challenge maybe led to an innovation? Make sure that we avoid any company-specific stuff, but any ideas that come to mind?

Rich: Absolutely! And from a broad sense, I would say that one of the cool things about a challenge is that it usually generates a team, who sits down and examines or thoroughly thinks through something, gets into all the details of it more than maybe ever before. And on the backside of it comes a great understanding of that problem with a very well-rounded solution. Problems tend to trigger that level of critical thinking that then delivers the perfect solution.

Mike: Oh Rich, I got another welding question! I was reading about this technique that's called "friction welding," "stir welding." Is that a common thing? What is it used for? How does it work?

Rich: And that's a good question. There's various forms of friction welding. Friction stir welding, specifically, is something that is widely used in aerospace, developed back in the 90s. It's widely used because it's a solid-state welding process that doesn't necessarily deteriorate the mechanical properties of the base material. So, we're not necessarily heating materials. We're taking them into that——the technical term I like to use is "a mushy stage"——prior to melting and joining two materials together. Various methods of friction stir welding in various applications.

Just to add on to that a little more, Mike, there's companies experimenting with it in other industries outside of aerospace. Though created for an aerospace application,

it's becoming a more prominent process because of what we just talked about.

Mike: Hmm, interesting. So that's something that our current welding programs might look at their own curriculum and make sure that at least have an introduction to that process themselves. That's a good point, Rich.

Let's turn now to the workforce, if you don't mind. So, what gaps might you see? Or maybe your colleagues see? You have somebody new coming in, right? Someone has just entered your workforce. They came out of maybe an education program. Maybe they re-skilled from another industry. What gaps are you seeing in their knowledge and ability? And then, you know, my follow up question is going to be, "How could we better close that gap?" So, number one, what gaps are you seeing? Number two, any ideas about closing those gaps?

Rich: Great question. My first comment would be that certainly something that is very well taught, widely taught very well, is welding itself——our shield metal arc processes, our gas metal arc processes. Teaching someone to weld is something that many educational facilities do very well everywhere.

I think that something that would further help an entry level employee in any manufacturing is a more well-rounded scope on manufacturing, in general. So, some of our advanced welding processes, as mentioned——we specifically talked friction stir here. But maybe we take a look at some of the others that are out there. Or an exposure to automation, advanced manufacturing techniques, whether that's automated weld cells or automated riveting cells, or something of that nature. Just an exposure to some of the new manufacturing facilities that exist today.

Mike: So, I see——thinking about welding as part of a manufacturing process as opposed to just stand-alone welding.

Rich: Exactly.

Mike: You look at an existing workforce. Remember, we just a moment ago, talked about new entrants. But suppose you have an existing workforce, let's say a technician working at an aerospace company or a company like yours. How did they keep their skills up to date? Do you send them off for vendor training? Do they look at YouTube? Or maybe they

have an expert welder that teaches them the process? How does it work in a company? How do current welders upskill?

Rich: One interesting thing about welders, from my little bit of experience I have, is most welders really enjoy what they do. They want to actively improve their knowledge and understanding of welding. From a manufacturing control standpoint, in a lot of cases, every few years, a welder may have to recertify. But, in other cases, there's plenty of opportunities to go to an evening class or take an extra training to learn a new process or learn a new welding technique.

Mike: Hmmm. So, use a variety of techniques. And you mentioned that Continuing Ed. That seems like a good idea.

I've got a COVID-related question for you. Here we are—still in the pandemic. A lot of things are remote now. And that caused me to think about this question. Do you think a welder will be able to operate welding equipment remotely at some point? Or maybe they do it already? I mean, will there be such a thing as a remotely operated welding equipment?

Rich: I believe there will, Mike, with the turn of automation in the way that we're developing technology, industrial robotics. But there will always be tasks that a robot or automation can't do. It's really going to depend on the application and the industry. But having that ability, I certainly believe——if it doesn't already exist——it will soon.

Mike: Okay, cool. Here's probably about the last question. You're in an industry that certainly is "future focused." That's for sure. So, if you had to talk to a young person, what might the future look like for somebody who might be contemplating a career that involves welding? And maybe fabricating very unique things? You know, I have to admit that some candidates say that manufacturing and welding is "dark, dirty, and dangerous." Is that still the case? What do you say to a young person contemplating a career in this field?

Rich: Yeah, as we've mentioned many times, certainly, we have to learn the basics of welding, in all cases. And I don't think that's something that'll ever go away. Our shop classes where we teach shield metal arc welding, gas metal arc welding, gas tungsten arc welding——and we learn the basics and we start to understand welding itself.

And then stepping on top of that, it would also be great to begin to learn some computers, electrical, systems, robotics—and start to understand that not all welding today is shield metal arc welding anymore, and these systems get very complicated. So, it almost becomes an engineering level of understanding on many systems.

So, my advice would always be to learn the basics. But also keep in mind that there's a lot of electrical, and controls, and system-level learning that could take place that would help you as someone trying to pursue a career in the welding field.

Mike: That's pretty good. Heh, I have to admit, if I was in welding program, I'm not sure I would expect to see stuff on controls and all that. But maybe that's the future, or the "future now," as our programs are adapting to these emerging manufacturing processes, emerging technologies. So, it's a good point, Rich.

You know, today in our discussion, I appreciated your comments. We talked about materials from those light and thin materials. We talked about different welding processes, including laser welding. And also the automated side of all this welding processes that's happening in industries as they're trying to drive costs and improve quality. So, those are good comments there. I think the idea of understanding the manufacturing process that welding is a part of—that's one of the most important things our workforce educators—people that are preparing the workforce—could think about integrating into their programs. Does that make sense, Rich?

Rich: It very much does. It's part of the entire system. Welding is one piece of the puzzle.

Mike: Cool! Rich, that's it for our discussion today. I certainly appreciate your taking your time out of your day. And giving your perspective as a relatively young welding engineer on what you see across the aerospace industry. We really appreciate your comments. And our folks listening to the podcast will take your things at heart. I'll put some show notes here that talk about some of the newer welding technologies. And again, Rich, we appreciate your time and effort today.

Rich: Thank you, Mike.

Mike: That's it for today, listeners. You heard Rich Little, a welding engineer, stress quality, and a need to understand, not only the welding process, but also the manufacturing process that the welding process fits into.

Your action today is to take a look at welding programs, training education programs, that you might know. You might not teach in them yourselves, but you're probably connected with one in some way. Think about the students in those programs, or potentially the incumbent workforce that might participate in those programs as well. Can they program an automated welder? Do they have experience with the newer techniques like laser welding or friction stir welding? Do they have a sense of Welding as a process? Do the students and trainees bear the responsibility for quality checks on weld data monitoring? Can they weld ultralight and thin materials? As they emerge or re-enter the workforce, they're going to face those challenges. So, think about that, and maybe have a discussion with your colleagues. In the Show Notes, you'll see a number of resources that I've linked to help you in this task.

I would also like to acknowledge the production of this podcast. Our Audio Engineer is John Chamberlain at CORD. Thank you, John, for all the excellent work that you do. And our project, Preparing Technicians for the Future of Work is led by the Principal Investigator Ann-Claire Anderson. You can access our podcasts online from our website, PreparingTechnicians.org or via Google Play, or Apple Podcast. A rating and review is always appreciated.

And thank you for listening to Preparing Technicians for the Future of Work.

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Lesiecki, Michael (Host). Preparing Technicians for the Future of Work Podcast: Episode 27, *Welding Is One Piece of the Puzzle* (audio podcast, transcript). Center for Occupational Research and Development, Waco, TX. June 2021. Retrieved from http://www.preparingtechnicians.org/